Bioaccumulation Model Check-In

CPG-EPA Conference Call

November 13, 2018

623727

Meeting Objectives

- Review and reach agreement on the following:
  - FB4 model assumptions (primarily year-end weight) for determining growth and consumption rates.
  - Methods for incorporating FB4 model growth and consumption rates into LPRSA model.
- Review initial FWM results.

Percent Growth per Year

LPRSA Species	Gewurtz Growth Equation	VBGF Using FishBase Parameters		Generic Life History Estimate (per J. Clough)		Other Growth Estimates
		Best Estimate (n)	Range[a]	Best Estimate	Range	
SFF	233%	52% (7)	53-69%	173%	85-250%	480%
Small eel	75%	--	--	17%	11-33%	8%
Blue crab	71%	--	--	69%	62-76%	--
Carp	35%	15% (15)	9-20%	19%	11-29%	--
Catfish	48%	12% (1)	na	15%	10-21%	--
White perch	81%	37% (2)	na	43%	25-59%	21-27%
Large eel	59%	--	--	13%	7-26%	5%
Bass	62%	70% (54)	50-77%	29%	19-43%	--

[a] VBGF values from FishBase associated with lowest and highest temperature.

Resolution of Lingering Questions – Species for which no FB4 model is available

- No FB4 model available for invertebrates, small filter feeding fish (silversides), or American eel.
- **Invertebrates** –
  - Resolution: Use Arnot & Gobas equations (i.e., no changes to model)
  - Note higher respiration rate for zooplankton, which could consider if calibration issues.
- **Small filter feeding fish** –
  - Consider FB4 gizzard shad model?
  - Resolution: Use same model as for small forage fish because better matches life stage that we are trying to model.
- **American eel** –
  - Initially had proposed bass, but re-evaluated based on diet and percent growth.
  - Resolution: Use catfish model for eel.

Resolution of Lingering Questions – Other issues

- **Blue crab** –
  - Difference in blue crab model; appears to be result of different temperature range.
  - Ultimately question is whether we should cap growth rates (as done for consumption rates) – only an issue for crab
  - Resolution: discussion needed
- **Growth rate for small forage fish** –
  - Wide range of results, including difference in how VBGF parameters from FishBase are applied.
  - Resolution: discussion needed
- **Growth rate for bass** –
  - Two methods produced differing results; VBGF indicates that most bass are young (4 yrs of age or less).
  - Resolution: Use VBGF estimate of growth.

Selected End Weights for FB4 Model

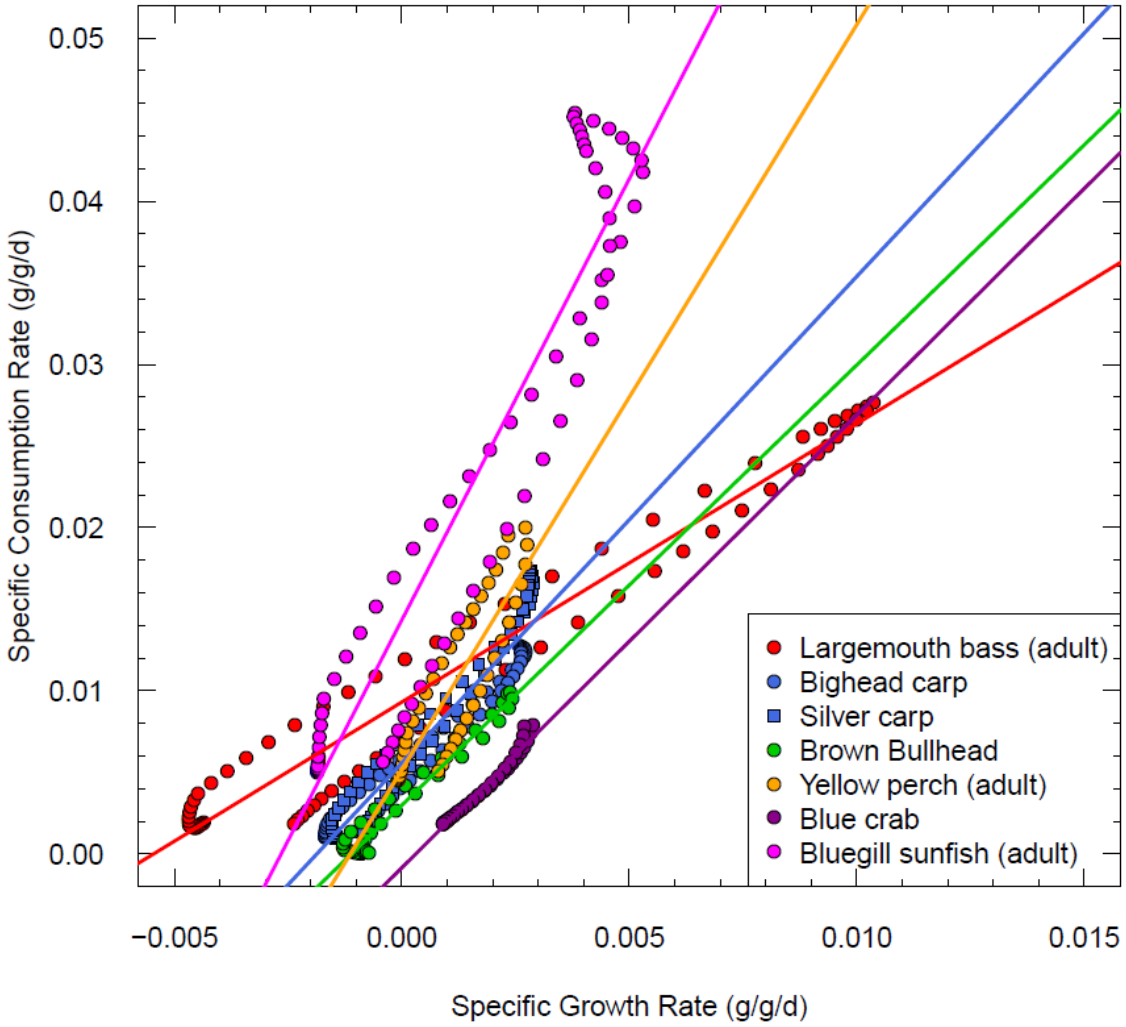
LPRSA Species	Starting weight (kg)	End Weight (kg)		
		Gewurtz	VBGF / FishBase	Literature (J. Clough)
Small forage fish	0.0027	0.009	0.0044 **	0.0074
Blue crab	0.14	0.24	-	0.24
Carp	3.1	4.2	3.6	3.7
Catfish	0.88	1.3	0.99	1.0
White perch	0.094	0.17	0.13	0.13
Bass	0.29	0.47	0.49	0.37

Note:
End weight is based on information from literature (identified by J. Clough) when ≤2 sets of VBGF parameters were available in FishBase.

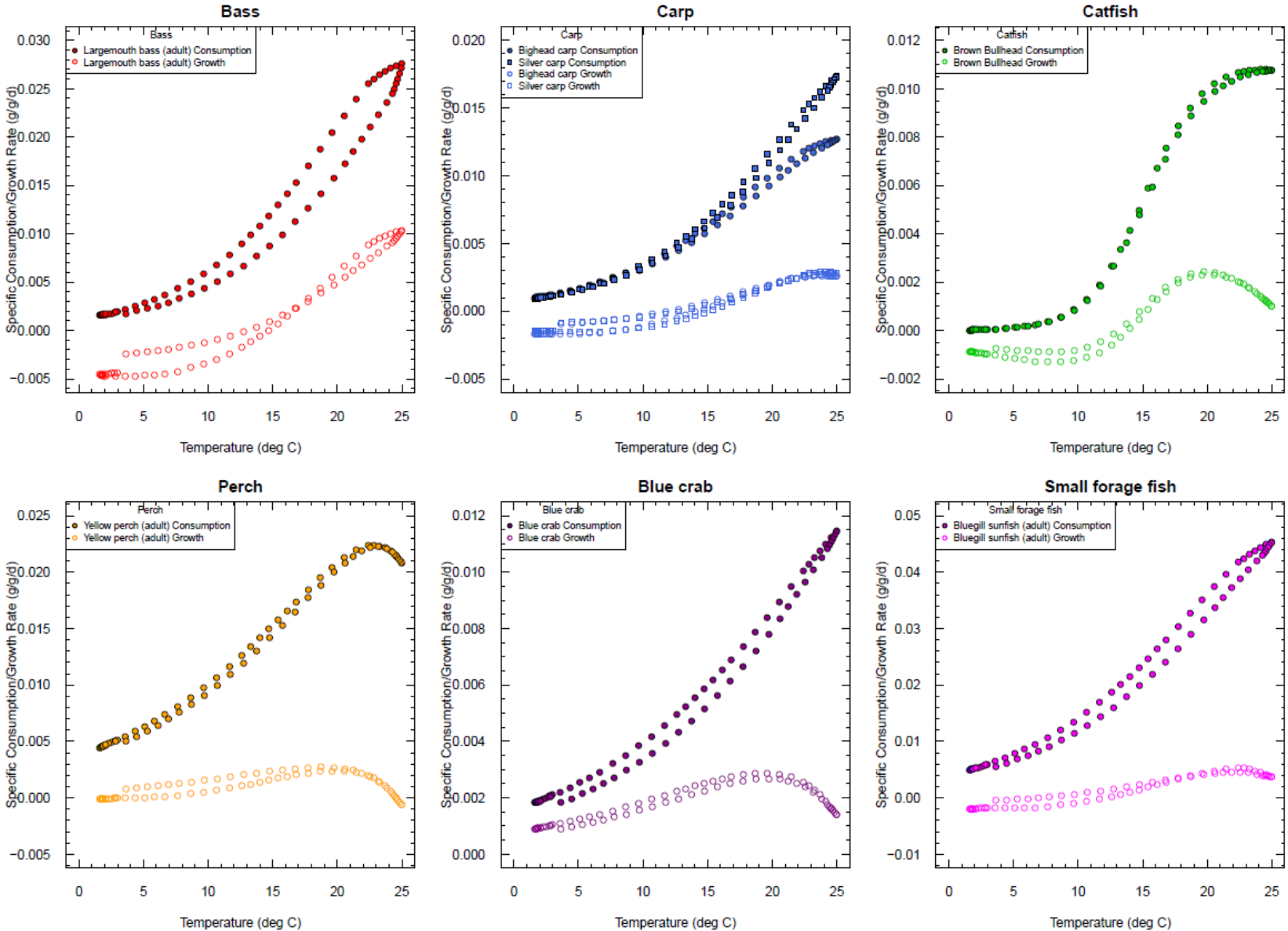
Incorporation into LPRSA FWM –
FB4 Model Estimates of Growth and Consumption

- **Step 1** – Develop relationship between growth rate and consumption rate for each species using FB4 model.
- **Step 2** – Evaluate how to calculate either growth rate or consumption rate as a function of temperature.
  - Temperature-consumption rate relationship is easier to model.
- **Step 3** – Develop relationship between temperature and consumption rate for each species using FB4 model.
  - Relationship based on log-normalized data
  - Set maximum equal to maximum observed in FB4 model over range of LPRSA temperatures.
- **Step 4** – Calculate growth rate from consumption rate using relationship developed in Step 1.
  - Need to set ceiling for growth rates as done for consumption rate? (Mainly just an issue for blue crab)

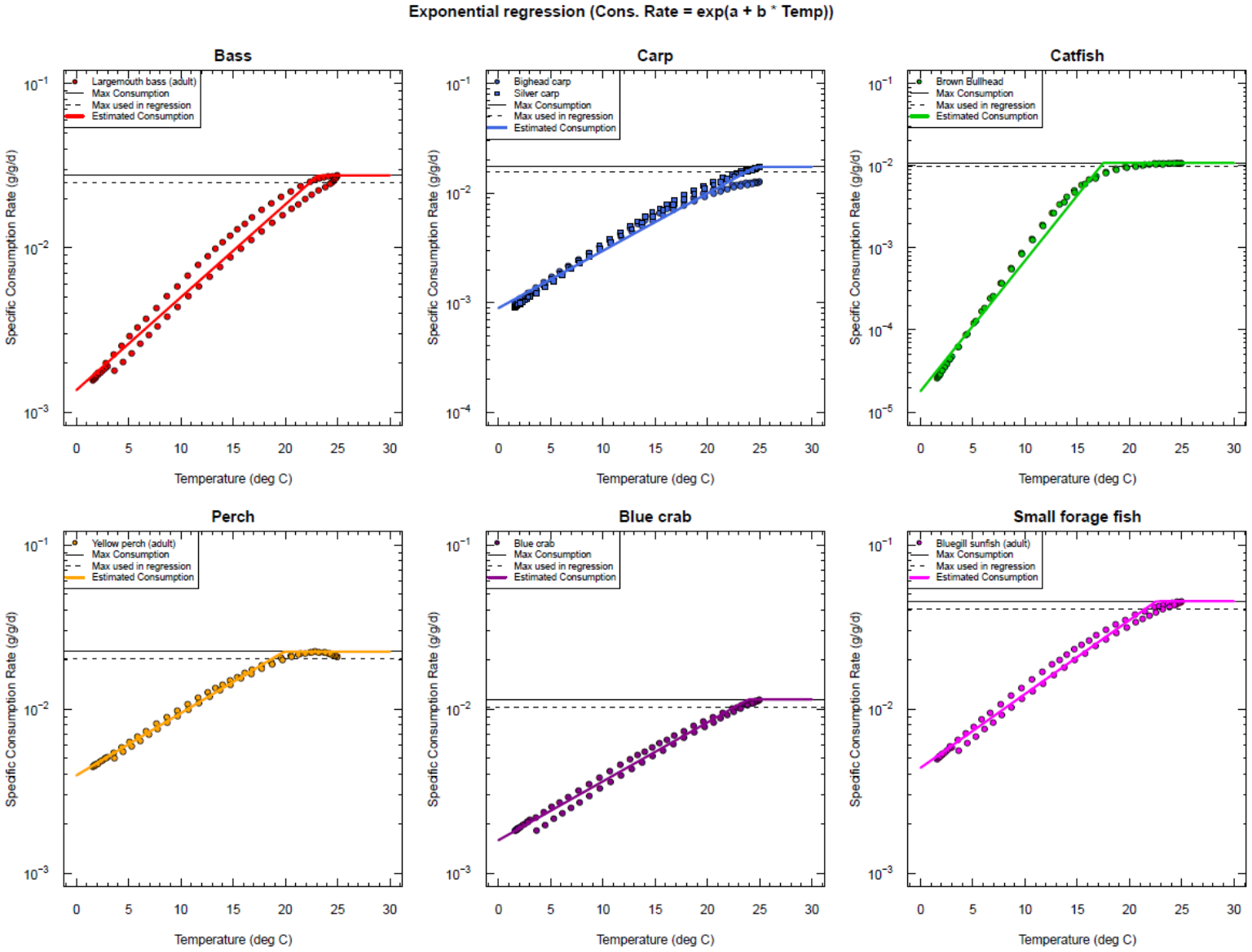
Step 1 –
Develop consumption-growth rate relationship



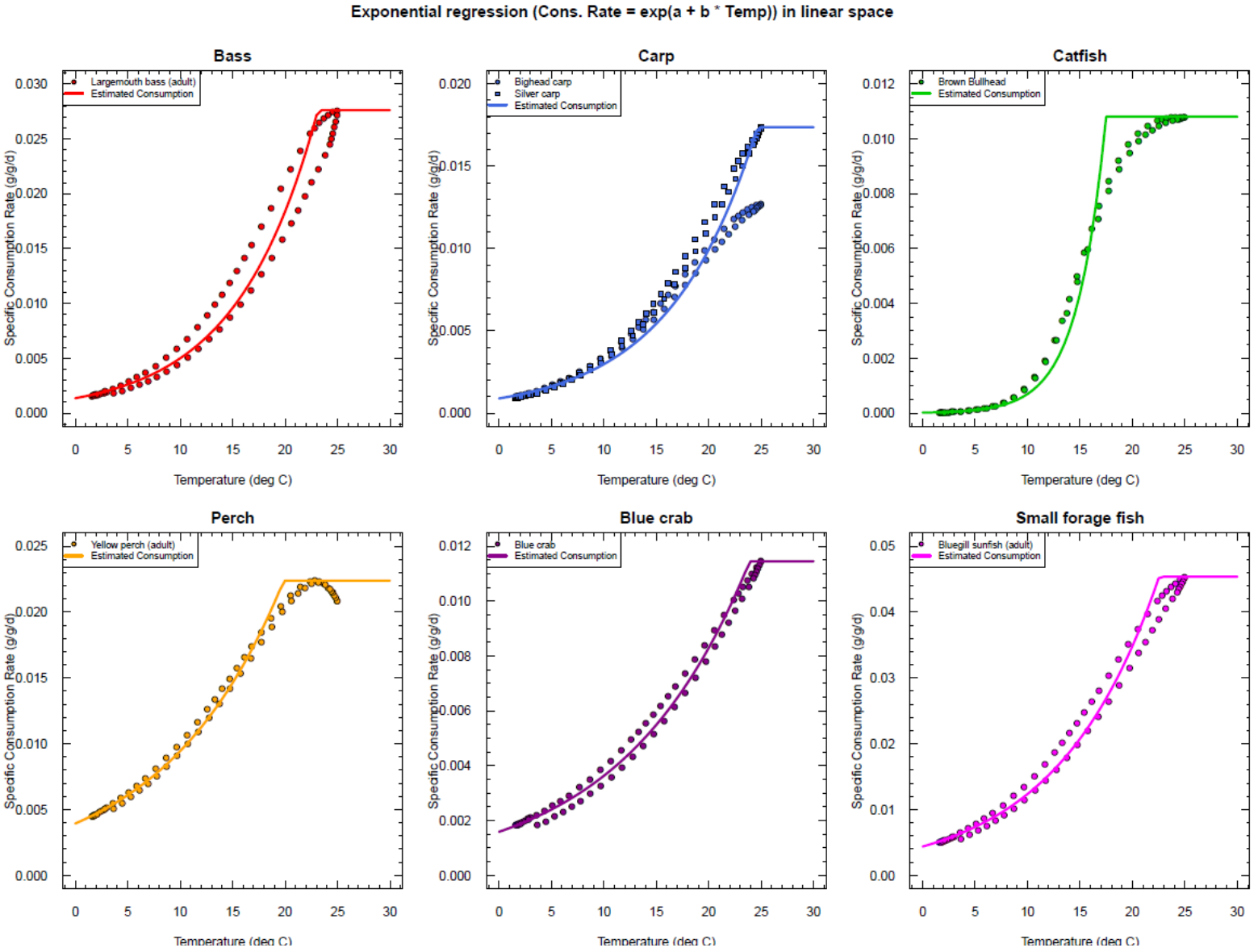
Step 2 –
Evaluate consumption and growth rates relative to temperature



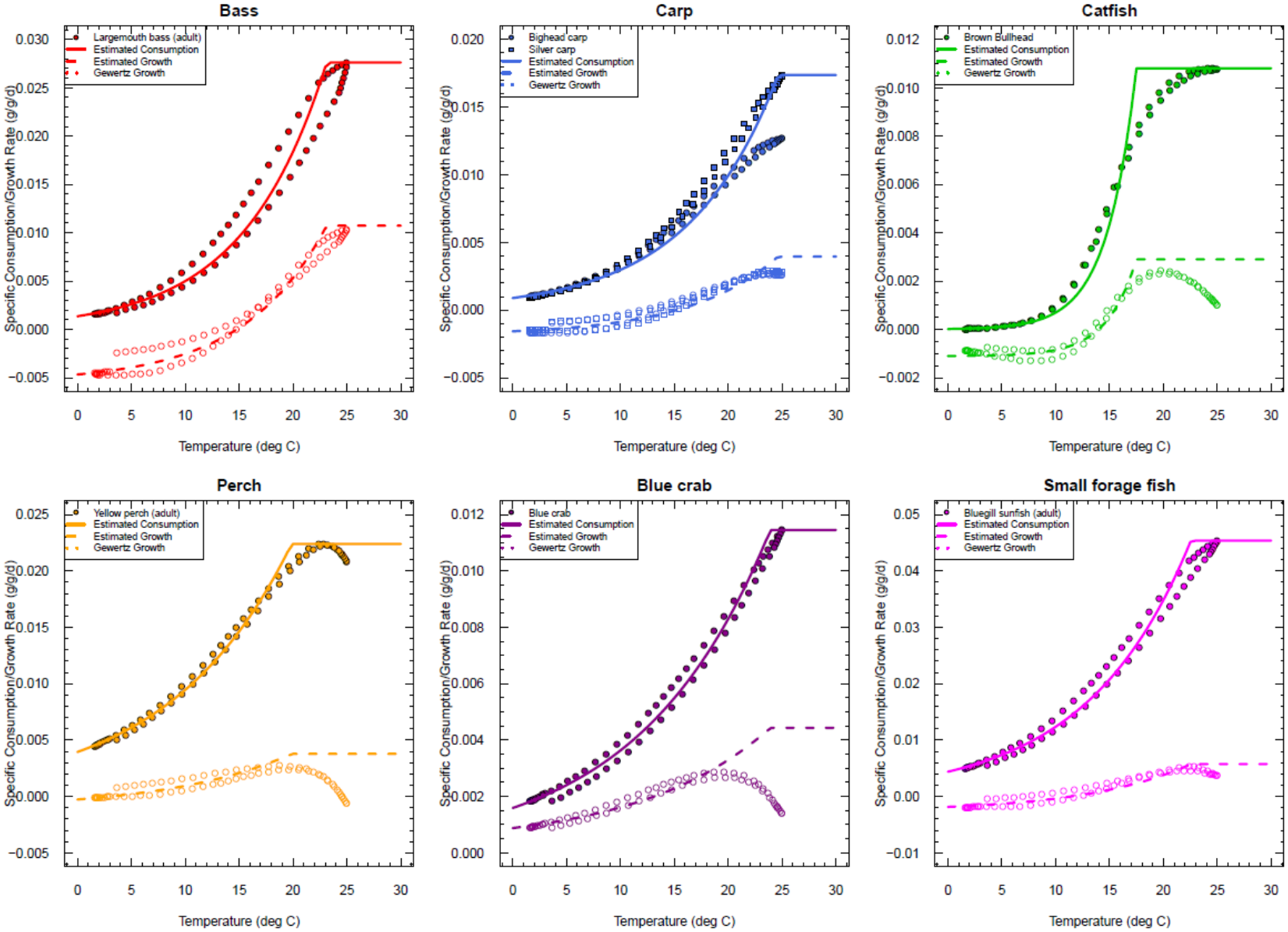
Step 3 –
Develop consumption rate-temperature relationship (1 of 2)



Step 3 –
Develop consumption rate-temperature relationship (2 of 2)



Step 4 –
Calculate growth rate from consumption rate



Review of Initial LPRSA Model Results

- Initial LPRSA model results look promising
  - Model runs based on "initial calibration," which used default parameter values with the following exceptions:
    - Changing weight for DEP
    - Reducing percent sediment in DEP diet
    - Reducing DO SAT for RM 6-14.7
    - Changing the dietary AE of NLOC and NLOM for invertebrates
- Some re-calibration will be needed (e.g., for metabolic rates).

Next Steps

- Complete any follow-up items from call and make needed revisions to model.
- Revise calibration based on updated model documentation.